

Industrial Engineering (in Mechanical Engineering), 2. cycle master study programme

1 General description of the programme

The master study programme of the first cycle “Industrial Engineering in Mechanical Engineering” within Faculty of Mechanical Engineering (FME) lasts two years. A student has to acquire 120 ECTS points. The study programme is aligned with the Bologna directives. The students can also continue their studies on PhD study programmes, which are also offered at our faculty.

Students of the Industrial Engineering study programme complement their knowledge of mechanical engineering with courses in business economics given by the Faculty of Economics and Business (FEB).

The study programme is related to other study programmes in Europe. Two study programmes “Industrial Engineering” from the high-ranked universities (according to Shanghai university rankings) were taken as the benchmark and comparison: Technische Universität München, Germany and Vienna University of Technology, Austria.

The Industrial Engineering study programme contains a balanced combination of knowledge that is in alignment with the recommendations of the European Society for Engineering Education (SEFI). It is also listed within FEANI INDEX – the institutions of engineering higher education in European countries and their engineering programmes, which are all recognized by FEANI (federation of professional engineers) as fulfilling the mandatory education requirements for the EUR ING title.

The study programme covers the following areas and subjects: research methods, technological subjects, business subjects and interdisciplinary subjects that are the focus of the study programme and master thesis. The mixture between FME and FEB subjects is around 60% : 40%.

The postgraduate master's study program of Industrial Engineering is aimed to educate engineers with theoretical-scientific and special practical skills to work on most demanding engineering problems in companies, where the engineers are able to solve difficult and complex problems based on theoretical and practical solutions, procedures and methods. In addition to that they are able to think about economic and business issues when solving problems and to manage production and business processes in manufacturing companies and other environments. The students will gain ability of abstract and associative study and analysis of problems in order to provide solutions and

development of different discipline and transfer knowledge to practice. The students will learn how to effectively apply modern engineering tools to solve most demanding mechanical engineering problems, combined with business oriented challenges. The possibility to adapt technical knowledge to other areas of expertise and interdisciplinary character of industrial manager's profile enables his/hers participation in all technical fields and economic sectors all over the world.

Expert areas for graduates in Industrial Engineering study programme are leading positions in mechanical and engineering companies, in technical and commercial sectors of companies, project managers in engineering and other companies, manager of research and development projects in various areas, top and middle management positions in companies, entrepreneur, product managers etc.

2 Short description of the study modules

Industrial Engineering in Mechanical Engineering study programme does not include any study modules.

3 General learning outcomes and competencies of the students

Postgraduate of the Masters of science study program Industrial Engineering is an expert with a broad and in-depth theoretical and methodological knowledge of solving complex problems in planning, managing and implementation of development, research and scientific tasks in the broad field of mechanical engineering as well as various employment positions. By implementing research methods, procedures and processes of the industrial engineering and by professional review, self-critical assessment and responsibility he/she is capable of modelling, planning, designing, manufacturing and maintaining of complex products, advanced machines and devices, by considering professional excellence, usefulness to the society, ethical responsibility, commitment to professional ethics and standards of environmental sustainability of his/hers creations. Postgraduates will have the ability to use economic and business sciences, natural sciences, mathematics and computer technology to solve technical and business problems and the ability to understand worldwide engineering and business challenges around us.

Students of master study program will be able to work on complex engineering, business and scientific tasks. The M.Sc. qualified engineers will have deeper knowledge and increased skills to solve most difficult engineering and business problems in industry and also the ability to work as a part of research teams. They will be able to seek new knowledge sources and apply most current scientific and research methods for practical solutions of different engineering and business problems. They will be able to accept the leadership responsibilities and transfer the results of scientific work to practical problems. The broad industrial engineering orientation of the study program will

generate creative and innovative potential of students. They will have the ability to work in teams and to communicate in written and oral form.

The M.Sc. qualified engineers with broad analytical and scientific knowledge will find employment in almost all branches of industry, R&D institutes, independent companies, design departments, as project engineers, product managers, experts, consultants, managers and entrepreneurs.

4 The main subject-specific learning outcomes and competencies of the students

The main subject-specific competencies that can be obtained by the Industrial Engineering study programme are:

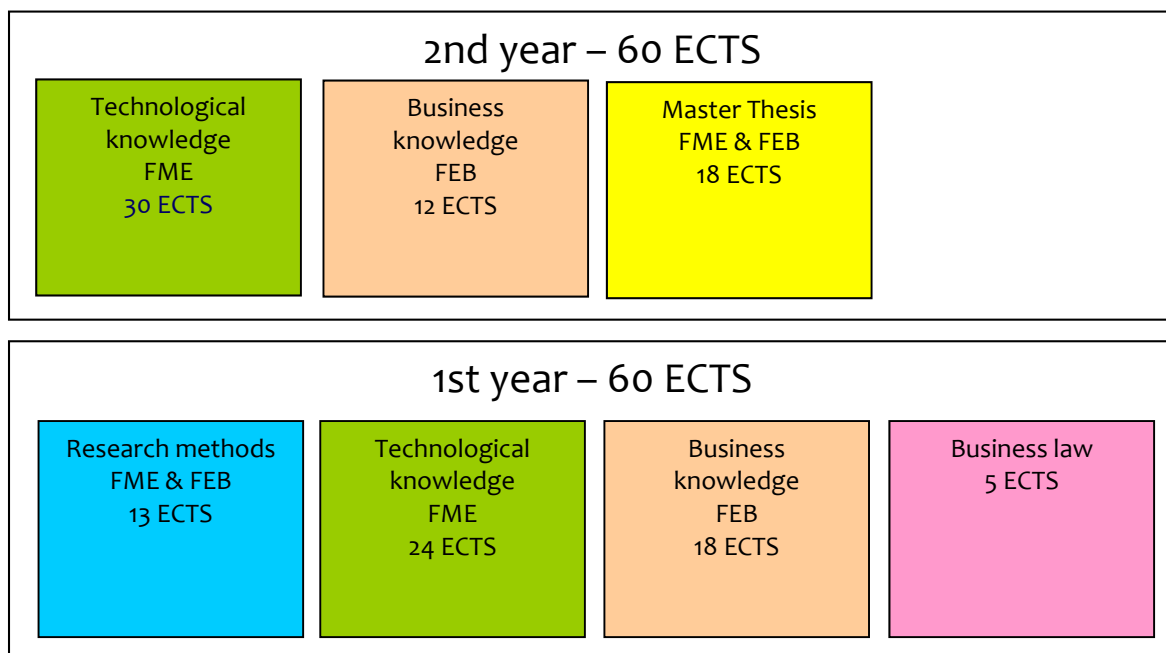
- an ability to use and deepen the knowledge in specific fields of mechanical engineering: power, process and environmental engineering, engineering design, production technologies,
- an ability to introduce new technological processes and production facilities,
- an ability to apply and upgrade processes and tools for modelling, optimisation and simulation of processes, machines, devices, manufacturing methods, products and production facilities,
- an ability to devise, develop and apply the modern production technologies, production automatisisation and new production concepts,
- an ability to evaluate information, material and energy flows by devising, designing, assembly, disassembly and maintenance of products,
- an ability for synthesis of the current production methods and technologies, based on analysing, evaluating and judging of existing production methods and technologies,
- an ability to systematically organise and manage a production process,
- an ability to analyse quality of products by applying appropriate measurements and quality assurance,
- an ability to conduct and evaluate measures for flawless functioning, maintenance, and environmental correctness of products during their total life-time,
- an ability for interdisciplinary understanding of the activities in the production systems,
- an ability to permanently develop skills by application of knowledge on the specific professional area,
- an ability to apply modern computer, information and communication technologies in the assessment procedures in specific professional area,
- an ability to plan and implement projects in different environments,

- an ability to think about commercial aspects of new products, systems and product-related services,
- an ability to plan and control costs,
- an ability to manage investments in equipment and facilities,
- an ability to govern organisational and managerial principles of companies.

5 General curriculum

The 1st study year (first two semesters) contains 9 compulsory courses in the amount of 54 ECTS and 1 elective course (6 ECTS). The 2nd study year (third and fourth semester) contains 4 compulsory courses in the amount of 24 ECTS and 3 elective courses in the amount of 18 ECTS. In the spring semester (4th semester) of the second study year students work on Master thesis task in the amount of 18 ECTS. The Master thesis work comprises scientific and research work on a certain chosen engineering problem, enriched with business aspect of the problem. The students have to prepare the Master thesis and publicly present and defend it in front of an examination board. They have two mentors: one from FME and one from FEB. The Master thesis work significantly contributes to the final student M.Sc. classification. After finishing the studies they can continue their studies on PhD study programmes, which are also offered at our faculty.

The master-level diploma study programme of Industrial Engineering in Mechanical Engineering is divided into the following two parts:



The study programme has altogether 24 ECTS for elective subjects (12 at FME and 12 at FEB).

6 Detailed curriculum

1. year							
Subject	1 st semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Selected Issues in Business Contract and Corporate Law	30	0	30	60	90	150	5
Corporate Finance	30	0	15	45	135	180	6
Statistics and Research Methods	45	0	45	90	90	180	6
Advanced Engineering Materials	45	15	15	75	105	180	6
Methodology of Experimental Work	45	0	30	75	135	210	7
Together semester:	195	15	135	345	555	900	30

Subject	2 nd semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Programme and Project Management	30	0	15	45	135	180	6
Ecoengineering	35	10	30	75	105	180	6
Production Systems	30	15	15	60	90	150	5
Project work II	0	30	0	30	180	210	7
Elective subject FEB I	30	0	15	45	135	180	6
Together semester:	125	55	75	255	645	900	30
Together year:	320	70	210	600	1200	1800	60

2. year							
Subject	3 rd semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Governance and Strategic Management	30	0	15	45	135	180	6
Goal Driven Product Development	45	10	20	75	105	180	6
Integrated Manufacturing Systems	45	10	20	75	105	180	6
Production Systems' Design	30	15	30	75	105	180	6
Elective Subject FEB II or FME I	30	0	15	45	135	180	6
Together semester:	180	35	100	315	585	900	30

Subject	4 th semester				Cont. hours	Individ. work	Hours	ECTS
	L	S	T	K				
Elective Subject FME II or FEB I	30	15	15	0	60	120	180	6
Elective Subject FME II	25	5	10	0	40	140	180	6
Master Thesis	0	0	0	30	30	510	540	18
Together semester:	55	20	25	30	130	770	900	30
Together year:	235	55	125	30	445	1355	1800	60
Together 2 years:	555	125	335	30	1045	2555	3600	120

ELECTIVE SUBJECTS

Elective subjects from FEB I (Faculty of Economics and Business):

Subject	2 nd and 4 th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Communication, Motivation and Conflict Solving	15	15	0	30	150	180	6
Strategic Human Resource Management	30	0	15	45	135	180	6
Entrepreneurship Process	30	0	15	45	135	180	6
Developing and Introducing Management Concepts in Practice	30	0	15	45	135	180	6

Elective subjects from FME I (Faculty of Mechanical Engineering):

Subject	3 rd semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Mechatronics Systems	45	10	20	75	105	180	6
Advanced Machining and Forming Systems	45	0	30	75	105	180	6
Internal Transport and Logistics	30	10	35	75	105	180	6

Elective subjects from FEB II (Faculty of Economics and Business):

Subject	3 rd semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Organization Theory	30	0	15	45	135	180	6
Project Oriented Strategic Management	30	0	15	45	135	180	6
Business Information Solutions	30	0	15	45	135	180	6
Mergers and Acquisitions	30	0	15	45	135	180	6
Strategic Supply Chain Management	30	0	15	45	135	180	6

Elective subjects from FME II (Faculty of Mechanical Engineering):

Subject	4 th semester			Cont. hours	Individ. work	Hours	ECTS
	L	S	T				
Intelligent Manufacturing Systems	15	20	5	40	140	180	6
Additive Technologies and 3D Printing	30	0	10	40	140	180	6
Product Development, Knowledge and Innovation Management	15	15	10	40	140	180	6
Methods and Tools for Quality Assurance	20	10	10	40	140	180	6
Robots and Robotisation	30	0	10	40	140	180	6
Energy and Environment	30	0	30	60	120	180	6